WATER

RESOURCES

CHAPTER

WATER RESOURCES

WATER RESOURCE RECOMMENDATIONS

The Master Plan recognizes that water resources are an important and limited resource and makes the following recommendations:

1. The Town should consider the quanity of water availble to meet demand when considering growth management options.

2. Whenever possible, the town should take a watershed approach to protecting water resources and dealing with drainage issues.

3. The expansion of the municipal sewer system should be limited so that the amount of water not returned to the ground is limited and the load on the sewer treatment plant is reduced.

4. The town should consider requiring water conserving plumbing devices such as low-flow toilets and reduced water flow shower heads in new homes and as plumbing replacements are installed.

5. The town should encourage the Hampton Water Works Company to charge a higher rate for water consumption in excess of a minimum standard, to undertake water conservation measures, off season metering, and to develop a comprehensive water leak detection program.

6. The town should undertake a study to develop methods to reduce municipal water consumption.

7. The town should promote regional cooperation in addressing the water supply situation.

8. In an effort to increase the infiltration of rain water to the aquifers, the Planning Board should consider amending the zoning ordinance to reduce the maximum amount of sealed surface in some districts.

9. In order to provide additional protection to the existing wells, the Planning Board should investigate enacting the NH Wellhead Protection Program.

10. The Planning Board should consider amending the Aquifer Protection Ordinance to incorporate the new aquifer delineation information from the United States Geological Survey.

11. The Planning Board should require site and drainage designs that retain stormwater on site rather than pipe the water away to the ocean.

12. The town should revise the Master Drainage Plan to update it to current fiscal realities and to reflect the change in philosophy regarding retaining water on-site.

INTRODUCTION

The protection and wise use of water resources are of critical concern to Hampton. With the entire population dependent on groundwater, from both private wells and the Hampton Water Works wells, the quantity and quality of this resource must be protected from excessive depletion and/or contamination. Other water resources such as swamps, ponds, rivers, streams, and wetlands are important not only because of their hydrological connection to groundwater resources, but also because they provide ecological, scenic, and recreational value to the community as a whole.

In general, there is a direct relationship between land use and water quality. The right use in the wrong area, or the right use carried out in the wrong way, can degrade and contaminate both surface and groundwater, increase flood hazards, destroy water-based wildlife habitat and interfere with scenic and recreational value. It is, therefore, the responsibility of the Town to take reasonable precautions to protect common water resources from incompatible uses and, in so doing, protect the health and general welfare of the community.

SURFACE WATER BODIES

Surface water systems are any type of water resource located above the ground on the earth's surface. Examples of surface water systems include: streams, rivers, marshes, ponds, bogs, lakes, wetlands, etc. Surface water systems are more dynamic than groundwater systems, in that they are influenced by the effects of wind, rain, and temperature. They are also subject to varying rates of flow, such as the difference between the flow rate of a river as opposed to that of a pond.

Since surface water systems flow over the land's surface, they are more susceptible to pollution caused either by hazardous materials located in close proximity to the system, or by pollutants discharged directly into the water. There are two types of pollution source categories: nonpoint sources and point sources. A nonpoint pollution source travels over or under the land to the water resource, whereas a point pollution source discharges directly into the water resource, for example, a malfunctioning sewage treatment plant.

Surface water resources function as holding areas for flood waters and seasonal high waters. In addition they serve as recharge areas and discharge points for groundwater

resources. The point of discharge is where the surface water resource and the groundwater resource are hydrologically connected. Most commonly, a surface water resource will act as a discharge point for groundwater. Such a discharge can replenish surface water resources as well as individual water wells during the dryer summer months. However, if dry periods are prolonged, the result can be an overall lowering of the water table.

A. WATERSHEDS

The watershed is the principal focus in describing a surface water system. A watershed is the land area within a series of connecting higher ridges that drain surface water to the lowest point, which is where a stream or river flows out of the watershed. The network formed by rivers, streams, lakes, and ponds is known as the drainage system of the watershed.

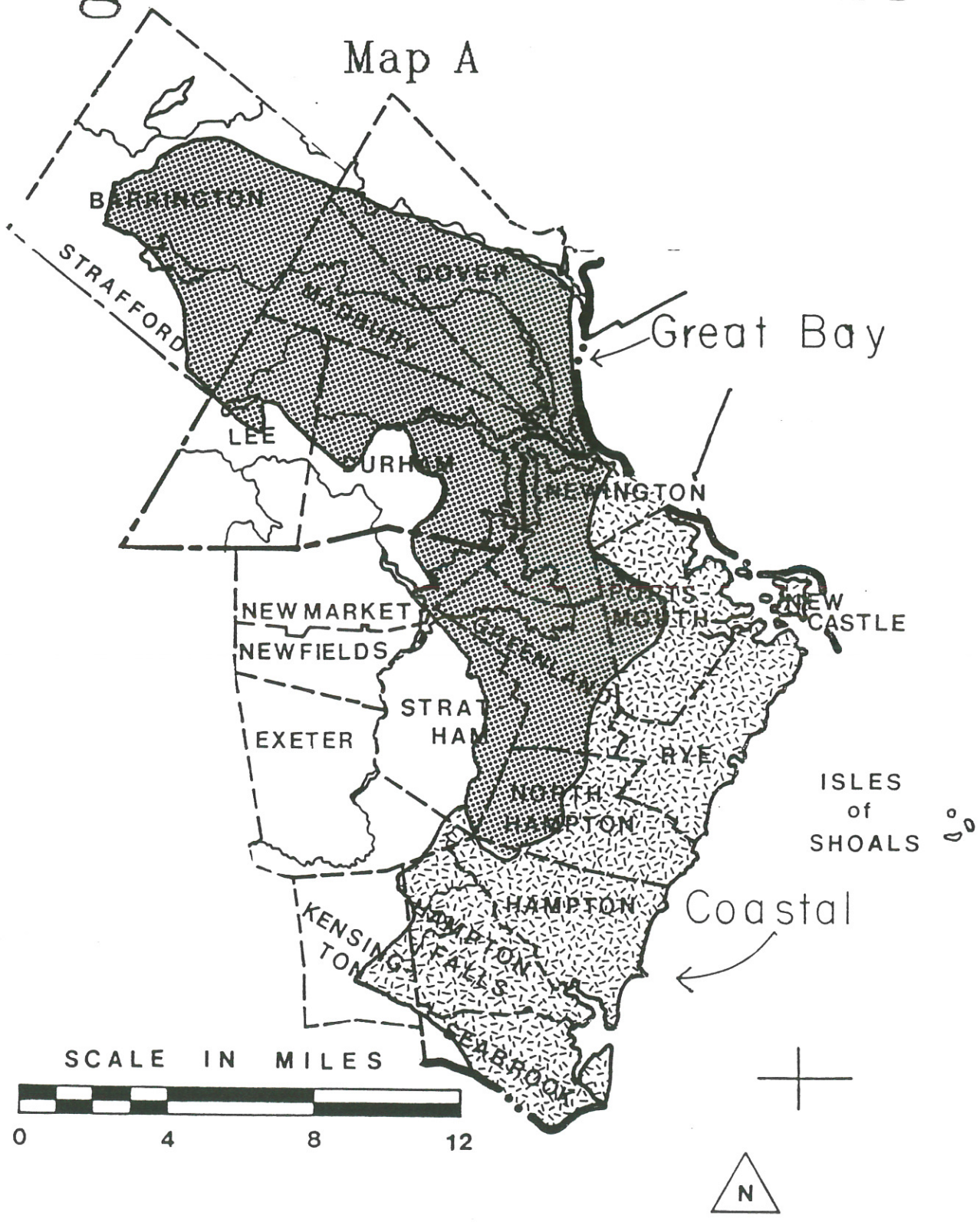
The Town of Hampton is located within two regional watersheds - the Coastal watershed and the Great Bay watershed. The watershed boundaries shown on Map A - "Regional Watersheds" - were delineated by the Rockingham Planning Commission using 7.5 minute topographic maps from the U.S. Geological Survey. As the map shows, only a small portion of the northwest part of Hampton is located within the Great Bay watershed. Most of the town is in the Coastal watershed.

The Hampton portion of the Great Bay watershed is so small that it has no sub-watersheds. The Coastal watershed has many sub-watersheds, including three that contain portions of Hampton (see the Surficial Hydrology and Watersheds Map). The characteristics of these sub-watersheds are described below.

1. Taylor River/Hampton River Sub-watershed: The largest sub-watershed in Hampton is the Taylor River/Hampton River sub-watershed, which is part of the Coastal watershed. It extends into portions of Exeter, Kensington, and Hampton Falls. Within this sub-watershed there are seven named perennial watercourses, including Drakes River, Landing Brook, Nudd's Canal, Blind Creek, Tide Mill Creek, Eel Ditch, and Nilus Brook. There are many other unnamed watercourses with the area also. The sub-watershed contains four surface water bodies - Batchelders or Coffin Pond, Lamprey Pond, Mill Pond, and Meadow Pond.

2. Old River Sub-watershed: The next largest sub-watershed is the Old River sub-watershed, which is part of the Coastal watershed. It extends into portions of Exeter and North Hampton. Within this sub-watershed there are two perennial watercourses, the Ash Brook and Old River, which has several unnamed tributaries. The only surface water body in the sub-watershed is Car Barn Pond.

Regional Watersheds



Source: U.S.D.A./S.C.S. Hydrologic Unit Map.

3. Little River Sub-watershed: Only a small portion of the Little River sub-watershed is in Hampton. Located in the northeast corner of Hampton, the majority of the sub-watershed extends into North Hampton and Rye and is part of the Coastal watershed. Within this sub-watershed there are two unnamed perennial watercourses, one a branch of the Little River and one a tributary of Garland Brook in North Hampton. The sub-watershed contains six very small surface water bodies that are part of the Little River Swamp.

4. Winnicut River Sub-watershed: The northwest corner of Hampton is in the Winnicut River sub-watershed, which is part of the Great Bay watershed. It extends into portions of Stratham, Exeter, North Hampton, and Greenland. This sub-watershed contains the Line Swamp, which is the origin of the Winnicut River and some its tributaries. There are no surface water bodies in this sub-watershed.

Hampton contains approximately 830 acres of water area; this represent 9.1% of the entire town. Most of this is salt water. Mill Pond, Car Barn Pond, Batchelder (Coffin) Pond and Lamprey Pond comprise most of the freshwater area. None of these ponds are used to any great extent for recreational purposes, except for ice skating in the winter. One reason is that most of the ponds are very shallow. Most of the water recreation takes place along the six miles of the ocean shoreline.

B. WETLANDS

Hampton has a large number of significant wetland areas. Wetlands, defined by the Soil Conservation Service as those areas having poorly or very poorly drained soils, occupy approximately 38% of the total land area. Of that total, 12.2% are classified as poorly drained, while 7.3% are very poorly drained, and 18.8% are very poorly drained tidal wetlands. Most of the wetlands are found around the complex river system in the southern third of the Town and to the rear of the beaches.

The tidal marsh covers 1,554 acres of land along the Hampton and Taylor Rivers. This area is subject to daily tidal flooding and is unable to support heavy loads. These qualities present limitations to the building of roads and other structures on marsh soils. The prolonged exposure of marsh soils to air produces sulfur in acid form which has the potential to corrode metal and concrete materials.

The remaining 1,613 acres of wetlands are freshwater wetlands which are not subject to tidal flooding. These areas are located in the more interior sections of Hampton. Wetlands of this type are the ones expected to come under increasing development pressure as the land best suited for development is used up.

Wetlands are important, valuable natural resources and worthy of protection from inappropriate use. They have been found, in general, to provide critical ecological and socially valuable functions, including:

a. providing habitat and reproduction areas for plants, fish and wildlife;

b. absorbing and utilizing nutrients from associated lakes or streams;
c. helping maintain groundwater levels;

d. acting as flood water storage areas;

e. absorbing silt and other sediments caused by upstream erosion.

Additionally, wetlands can provide for recreation and aesthetic enjoyment. The filling of wetlands for building construction not only destroys wetlands, but may lead to groundwater contamination as well. Leaching fields constructed in filled areas are likely to have an inadequate receiving layer for proper treatment of the septic system's effluent and be placed too near the seasonal high water table below.

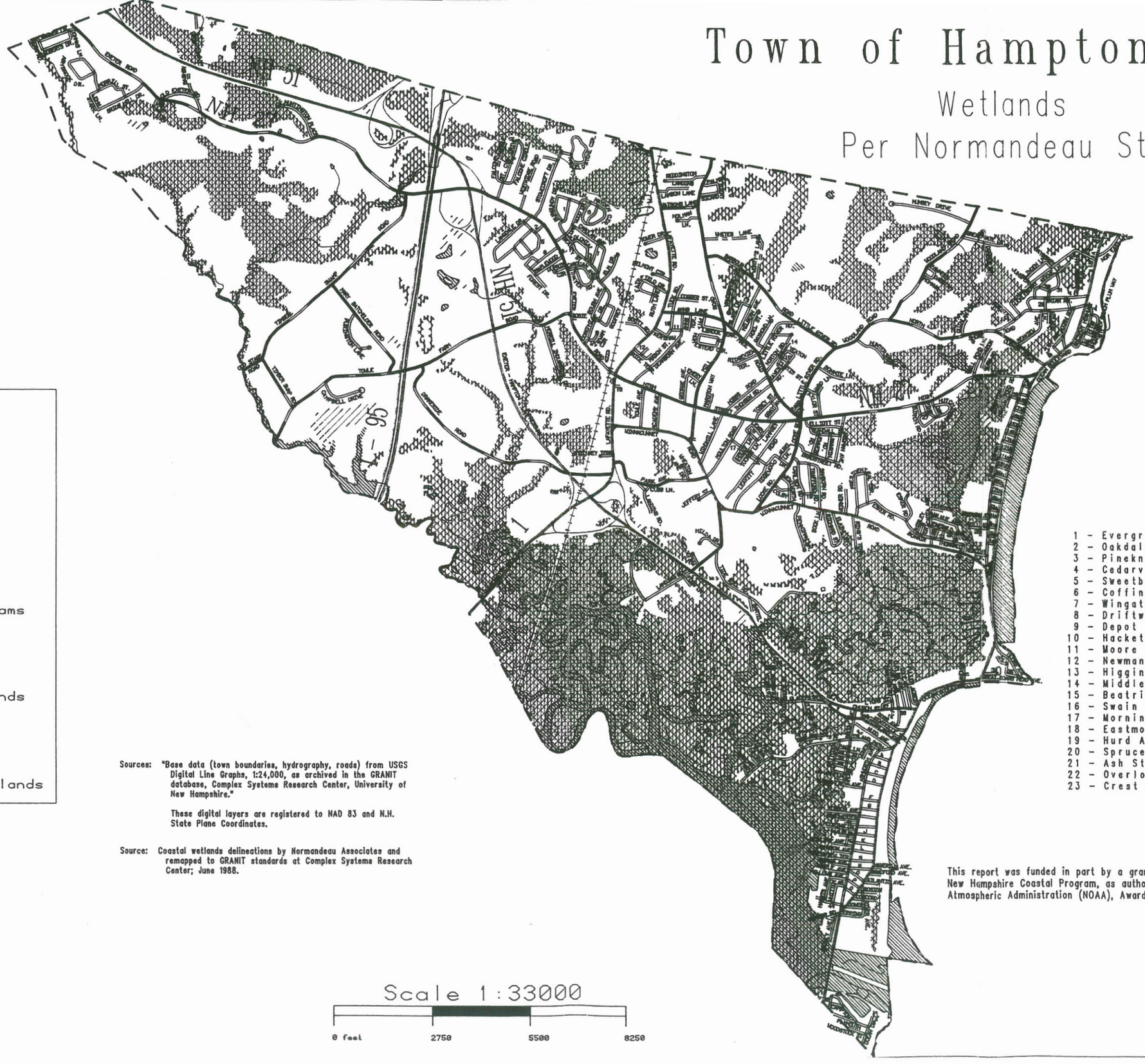
There is an ongoing need to protect wetlands in Hampton. Although the State of New Hampshire has laws and regulations in place, (RSA 482-A, administered by the Wetlands Board, and RSA 485-A, administered by the New Hampshire Water Supply and Pollution Control Division) they do not always provide the degree of protection needed. For these reasons, local control over the use of wetlands is recommended. A wetland conservation district ordinance and a map entitled "Wetlands Conservation District", were prepared by the Conservation Commission and endorsed by the Planning Board, were adopted at the 1985 Town Meeting. The reader is refered to this map for wetland locations. This ordinance, which has had minor amendments over the years, should provide the degree of protection for wetlands in Hampton.

Hampton is fortunate to have available to it a series of aerial photographs depicting wetlands at a scale of 1" = 200', prepared through the N.H. Office of State Planning Coastal Program. The maps and an accompanying report are entitled, "Phase 2 Report, Town of Hampton, the Coastal Wetlands Mapping Program, New Hampshire," prepared by Normandeau Associates, Inc., June 30, 1986.

The information from the Normandeau report was used to prepare the Wetlands Map, which shows the location of wetlands in Hampton. The original Normandeau maps and the wetlands map contained in this plan are useful for town wide planning purposes, but should not be utilized for on-site planning for specific development proposals. Field mapping of wetlands should be done to accurately identify the wetland boundaries.

Town of Hampton, N.H.

Wetlands
Per Normandeau Study



N

Legend

- Town boundary
- Primary Route
- Secondary Route
- Roads or Streets
- Unimproved Roads
- Ramps
- Railroad
- Shorelines, Streams and Brooks
- Rivers, Streams, Lakes or Ponds
- Classified Wetlands
- Surface Water
- Upland Areas
- Unclassified Wetlands

1 - Evergreen Rd.
2 - Oakdale Ave.
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4 - Cedarview Ln.
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Sources: "Base data (town boundaries, hydrography, roads) from USGS Digital Line Graphs, 1:24,000, as archived in the GRANIT database, Complex Systems Research Center, University of New Hampshire."

These digital layers are registered to NAD 83 and N.H. State Plane Coordinates.

Source: Coastal wetlands delineations by Normandeau Associates and remapped to GRANIT standards at Complex Systems Research Center; June 1988.

This report was funded in part by a grant from the Office of State Planning, New Hampshire Coastal Program, as authorized by the National Oceanic and Atmospheric Administration (NOAA), Award Number NA37OZ0277-01.

Scale 1:33000

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Prepared by the
Rockingham Planning Commission
September 28, 1994 DRA

One issue regarding wetlands that has arisen in recent years has been exactly how to define wetlands. The town has used soil types to identify wetlands since 1985. The state has used the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands to identify wetlands. This has caused considerable confusion for the local boards and the developers in dealing with two different wetland lines on a plan. In 1995 the Conservation Commission proposed to change the town's definition to match the states, but due to concerns that this would weaken the local ordinance, the Planning Board did not support the amendment. The state Wetlands Board is now considering changing their definition to the 1987 Army Corp of Engineers standard. The town should closely monitor the states actions concerning the definition of wetlands and then seek the advice of wetland experts in deciding the towns course of action.

C. FLOOD HAZARD AREAS

A Flood Insurance Rate Map was prepared for the Town by the Federal Emergency Management Agency (FEMA) in 1986. The National Flood Insurance Program, administered by FEMA, allows residents living in flood hazard areas to purchase flood hazard insurance at subsidized rates, however, the insurance is only made available to communities which participate in the program. In order to maintain the town's participation in the program, the Zoning Ordinance was amended in 1987 to adopt the required model floodplain development ordinance.

The Flood Insurance Rate Map, dated July 3, 1986, shows the estimated extent of inundation during a 100-year frequency flood, including areas affected by wave action near the coast. Many homes and businesses are located in flood prone areas. Development in flood prone areas is problematic in three ways:

1. it risks damage to life and property;

2. it reduces flood storage capacity of the floodplain, thus worsening flood conditions elsewhere; and,

3. the inundation of developed areas can contribute to water quality problems.

These problems can be controlled through the adoption of floodplain regulations as part of the National Flood Insurance Program. These regulations require any development to meet strict federal building codes specific to construction in flood hazard areas. This discourages unsound development in the flood hazard areas.

D. STORMWATER DRAINAGE

In 1986 the town hired G. & Underwood Engineers to prepare the Master Drainage Plan, which is a comprehensive analysis of the drainage system and a plan for the future construction of stormwater drainage facilities for the entire town. Problem areas are identified and listed by priority, and the town completes improvements as funding permits. One goal is to reduce the amount of storm water that enters the sewer system and increases the loads at the wastewater treatment plant. As development expands and intensifies, the storm water drainage system will need to be improved. Implementation of the high priority items in parallel with expanding development is very important; to date lack of funding has prevented performing these high priority items. The Capital Improvements Program should seriously consider this prioritized list from the Drainage Master Plan.

When the drainage plan was prepared, the policy of the town was to get as much stormwater into the town drainage system as possible and pipe it away to the ocean, rivers and wetlands. However the town has since adopted an aquifer protection ordinance that encourages the retention of water on site to allow for filtration of the water into the ground to replenish the aquifers. Additionally the financial burden needed to complete the drainage system for the entire town would be cost prohibitive. It is recommended that the town revise the Drainage Master Plan to reflect the desire to replenish aquifers with the stormwater runoff and to be more realistic about what the town can afford in terms of new drainage facilities.

GROUNDWATER RESOURCES

Groundwater is a concentration of subsurface water, occurring in saturated soils and geological formations. It is resupplied through precipitation and surface water discharge. Water infiltrates the ground through an aerated zone where impurities are filtered out. Then water moves to a saturated zone where the pore spaces between soil particles are filled with water. These saturated zones are called aquifers. It is crucial that the earth's surface be able to transmit water so a portion can be stored underground as groundwater. If excessive compaction or extensive covering of the earth's surface occurs, the amount of water that can reach the saturated zone and become groundwater is reduced.

Aquifers (concentrations of groundwater) are found where saturated layers are permeable and the storage and transmission of water can take place. Aquifers having medium to high potential to yield groundwater occur in the New Hampshire seacoast area as alluvial deposits of sand and gravel (unconsolidated deposits) or in bedrock fractures (consolidated deposits). The major source of recharge to the aquifers of the seacoast area is through precipitation directly onto the aquifer's surface. In terms of the hydrologic cycle, approximately one-half of the average annual precipitation in the seacoast area is returned

to the atmosphere as evapotransporation. The other half is split between surface water discharge and groundwater storage.

The unconsolidated deposits, also called stratified drift deposits, contain sorted layers of gravel, sand, silt and clay. They are found primarily along valley bottoms. These materials have abundant pore space to store water, in fact, these pore spaces can account for more than 30% of the deposit's total volume. Consequently, these stratified drift deposits of sand and gravel have become good sources of medium to high volume aquifers.

Bedrock fractures normally do not yield the same quantity of ground-water that stratified drift deposits do, however, they cannot be overlooked in terms of contributing to a community's water supply needs. Bedrock fractures are more productive when the bedrock has a layer of sand and gravel over it. This allows recharge to occur directly from above. Bedrock fractures are usually adequate for domestic wells serving a small population. In contrast, a till aquifer is usually lower yielding and can have a short well life. This is due to a mixture of clay, silt, gravel and boulders which tends to compact due to the different soil particle sizes. The transmission and storage of water is greatly reduced in this type of aquifer.

Stratified Drift Aquifers

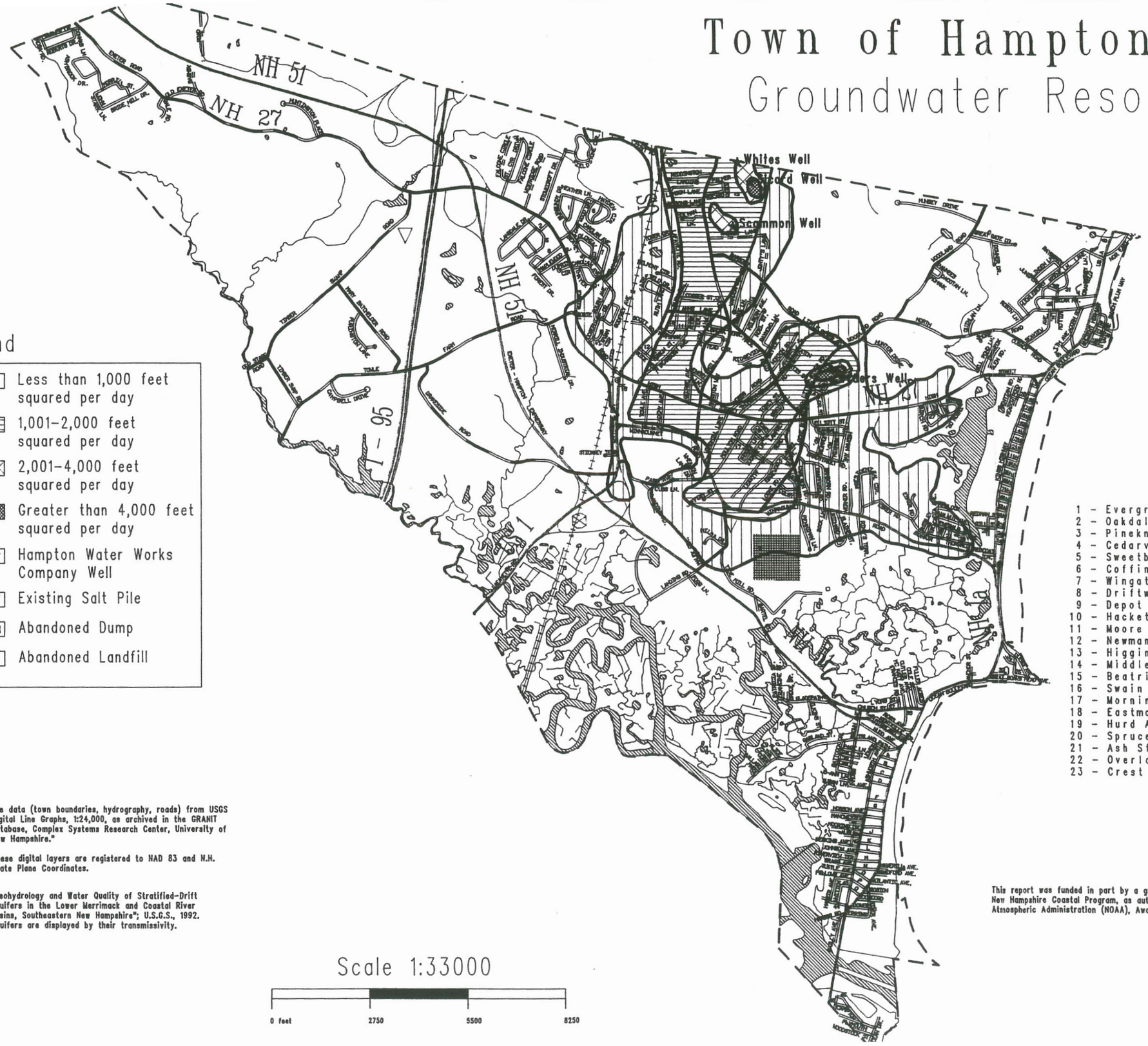
In 1993 the United States Geological Survey (USGS) completed the most through and accurate study of the region's groundwater resources to date. The report is entitled, Geohydrology and Water Quality of Stratified Drift Aquifers in the Lower Merrimack and Coastal River Basins, Southeastern NH. The report identified one large stratified drift aquifer in Hampton. A brief description of the identified aquifer follows and its general locations can be seen on the Groundwater Resources Map.

The stratified drift aquifer was identified by the USGS study as being located in the center of the town. The aquifer extends into North Hampton and is 110 acres in size. The Groundwater Resources Map indicates the aquifer's saturated thickness, which is defined as the thickness of an aquifer below the water table, and the transmissivity, which is the rate at which water is transmitted through the aquifer. It is not surprising to note that all four of the Hampton Water Works Company wells in Hampton are located in areas with high transmissivity rates. The aquifer is a coarse-grained stratified drift, with materials ranging principally from medium to sand to cobble gravel.

A large part of this aquifer area is already urbanized, but the threat of groundwater contamination is somewhat lessened because these areas are almost entirely served by municipal sewer lines. However, because of the high water table and lateral groundwater flow, an isolated pollution source could be spread underground. Soils don't have as long to filter out the contamination because the water table is so high.

Town of Hampton, N.H.

Groundwater Resources



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Legend

- Town boundary
- Primary Route
- Secondary Route
- Roads or Streets
- Unimproved Roads
- Ramps
- Railroad
- Shorelines, Streams and Brooks
- Rivers, Streams, Lakes or Ponds
- Landfill
- Less than 1,000 feet squared per day
- 1,001–2,000 feet squared per day
- 2,001–4,000 feet squared per day
- Greater than 4,000 feet squared per day
- Hampton Water Works Company Well
- Existing Salt Pile
- Abandoned Dump
- Abandoned Landfill

Sources: "Base data (town boundaries, hydrography, roads) from USGS Digital Line Graphs, 1:24,000, as archived in the GRANIT database, Complex Systems Research Center, University of New Hampshire."

These digital layers are registered to NAD 83 and N.H. State Plane Coordinates.

"Geohydrology and Water Quality of Stratified-Drift Aquifers in the Lower Merrimack and Coastal River Basins, Southeastern New Hampshire"; U.S.G.S., 1992. Aquifers are displayed by their transmissivity.

Scale 1:33000

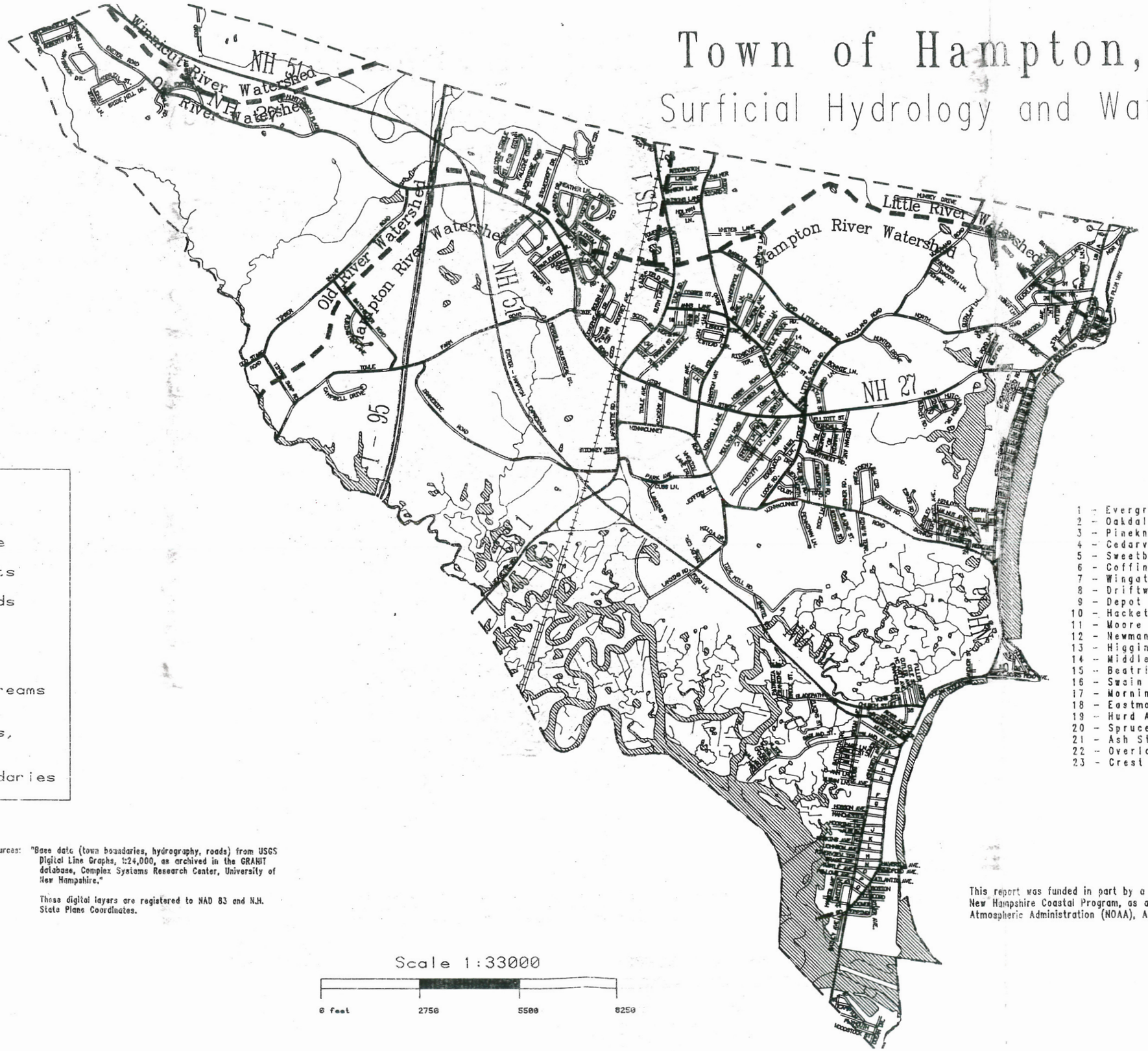
0 feet 2750 5500 8250

This report was funded in part by a grant from the Office of State Planning, New Hampshire Coastal Program, as authorized by the National Oceanic and Atmospheric Administration (NOAA), Award Number NA37OZ0X77-01.

Prepared by the Rockingham Planning Commission

Town of Hampton, N.H.

Surficial Hydrology and Watersheds



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Prepared by the
Rockingham Planning Commission
September 28, 1994 DRA

In an effort to more accurately define the recharge areas of their water supply wells, the Hampton Water Works Company hired Leggette, Brashears & Graham, Inc., consulting groundwater geologists. A report entitled, Evaluation of Recharge Areas for Water Supply Wells of the Hampton Water Works Company July 1987 was prepared by the firm. Figure 3 on page 9 of the report delineates the primary recharge area for the wells in Hampton. This information was transferred onto the Groundwater Resources Map. Hampton Water Works Company has five wells within the identified recharge area, four in Hampton and one in North Hampton. The proximity of these wells to commercial development along Route One and the airfield make the potential for contamination a great concern. Based upon the information in this and previous studies, the need for protecting Hampton's aquifers is as great as ever.

Existing and potential sources of groundwater pollution in the aquifer areas should be identified. One obvious area of concern should be the landfill, which is partially within the aquifer. These issues will be addressed in the closure plan for the landfill, which is currently being finalized. Other areas of potential pollution could include abandoned dump sites, salt piles, or even salt runoff from the major state highways. High density developments in unsewered areas of town could also cause groundwater pollution.

The Coakley Landfill in North Hampton, a superfund site, is a potentially serious source of groundwater contamination. Since Hampton relies on wells in North Hampton for a portion of its water supply, developments at the site could affect Hampton. Groundwater is a regional concern.

WATER SUPPLY

Public water supply is provided to the Town by the Hampton Water Works Company, an investor-owned and operated public utility that is a division of the American Water Works Company. In addition to Hampton, it also provides water service to North Hampton and to the Rye Beach and Jenness Beach sections of Rye. The company serves 7,500 customers in all three towns.

The water supply system serves all major developments in Hampton. Areas not served include: west of Interstate 95, North Shore Road, and south of Route 51. Water supply lines are usually extended wherever necessary to serve newly developed areas. According to the 1990 US Census data, the company serves 8,024 of the 8,602 housing units in Hampton. About 93% of the households receive their water from the company. The remaining population obtains water from private wells.

Hampton Water Works depends upon ten wells, located in Hampton (4), North Hampton (5), and Rye (1) for its water supply. All the wells are gravel packed except one in North Hampton that is a rock well. The total estimated safe yield of the wells is 4.35 million

gallons a day (mgd). On the average day, the company supplies Hampton with 2.15 million gallons of water. However, user demand increases about 200% during the summer months because of the large influx of people who take advantage of the recreational opportunities in the area. The estimated 66,000 summer residents cause the maximum day demand to exceed 5 mgd. In 1983, the maximum demand was 3.95 mgd, and by July of 1993 it reached 4.76 mgd.

The following is a list of Hampton Water Works Company wells:

Well	Location	Pumping Capacity
Ryders	Hampton	936,000 gpd
Scammon	Hampton	864,000 gpd
Sicard Street	Hampton	1,008,000 gpd
Whites Field	Hampton	518,000 gpd
Crenshaw	North Hampton	792,000 gpd
Rock Well-13A	North Hampton	432,000 gpd
Coakley	North Hampton	432,000 gpd
Marston Spring	North Hampton	180,000 gpd
Dalton Well 14	North Hampton	144,000 gpd
Jenness Beach	Rye	120,000 gpd

In addition to the wells, the company has three water towers located in Hampton. These are important because not only do they store large quantities of water to back up the wells, but they also help maintain water pressure throughout town. They are also valuable water sources for fire protection. One water tower is located on Mill Road and has a storage capacity of 300,000 gallons. The beach area is served by a 500,000 gallon water tower on Church Street. The third tower is located on Exeter Road near Interstate 95. It was built in 1983 and has a capacity of 750,000 gallons. The location is logical considering the potential for development in the western section of town.

The company also installs and maintains fire hydrants, of which there are over 236 in Hampton and a total of 428 in the company's franchise area. Although expansion of the hydrant system is costly, it should keep pace with the expansion of the water supply system.

Water rates are computed by metered volume charges after an initial minimum charge. In an effort to conserve water resources, the company undertakes a leak detection investigation twice a year. In recent years, the water company has had to institute voluntary water bans during the high demand summer months.

In 1995, the company was required to institute a mandatory outdoors watering ban due to the continuing water supply deficit and the extremely dry summer. In addition the NH Department of Environmental Services ordered the company to not permit any new water main extensions due to the serious situation. The company has been unable to obtain additional sources of water within its service area and has faced local opposition for wells located in Stratham. This water deficit could have serious impacts on the development situation in Hampton.